Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte HIDETOSHI ISHIDA, ATSUSHI NOMA, and DAISUKE UEDA

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Appeal No. 2003-0173
Application 09/484,473

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ON BRIEF

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Before WARREN, OWENS and JEFFREY T. SMITH, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal is from the final rejection of claims 8 and 11. Claims 5, 7, 9, 10, 12 and 13, which are all of the other claims remaining in the application, stand withdrawn from consideration by the examiner as being directed toward a nonelected invention.

THE INVENTION

The appellants claim a method for making a semiconductor device wherein at least one of a titanate layer and a silicon oxide layer is etched using an $HCl/NH_4F/H_2O$ etchant. Claim 8 is illustrative:

> 8. A method for farbricating a semiconductor device, comprising the steps of:
>
> etching at least one of a titanium material layer and a silicon oxide layer using an etchant, wherein said titanium material layer includes at least one material selected from the group consisting of $BaTiO_3$, $SrTiO_3$, $Ba_X Sr_{(1-x)} TiO_3$, and similar Group IIA metal titanates, and wherein the etchant includes a mixed liquid of HC1, NH_4F and H_2O; and
>
> setting a molar ratio of NH_4F/HC1 in the mixed liquid, the molar ratio being being set based on which of the at least one of the titanium material layer and the silicon oxide layer is to be etched.[1]

THE REFERENCES

Asselanis et al. (Asselanis)	4,759,823	Jul. 26, 1988
Moore et al. (Moore)	5,402,807	Apr. 4, 1995
Roh	5,828,129	Oct. 27, 1998 (filed Jan. 23, 1997)

[1] The broadest reasonable interpretation of claim 8 in view of the appellants' specification, *see In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989), is that the semiconductor device has both a titanate layer and a silicon oxide layer, at least one of which is etched with the $HCl/NH_4F/H_2O$ etchant.

THE REJECTION

Claims 8 and 11 stand rejected under 35 U.S.C. § 103 as being unpatentable over Asselanis in view of Moore and Roh.

OPINION

We reverse the aforementioned rejection. We need to address only claim 8, which is the sole independent claim.

Asselanis discloses a method for etching "PLZT family" materials, which are ceramic oxides containing two or more of lead, lanthanum, zirconium and titanium (col. 1, lines 29-35). The etching solution can contain NH_4F and HCl in a range of relative amounts (col. 2, line 50 - col. 3, line 5; col. 3, lines 30-33; col. 3, line 66 - col. 4, line 7; col. 14, line 65 - col. 15, line 2). A substrate having a PLZT family film thereon can, after sintering, be processed for semiconductor use (col. 3, lines 48-51).

Moore discloses that in the manufacture of integrated circuits, SiO_2 can be etched using ammonium fluoride and HCl in an aqueous base typically in a ratio of 4:1 to 20:1 (col. 3, lines 44-56).[2]

[2] The examiner does not address whether the applied prior art would have fairly suggested, to one of ordinary skill in the art, the use of Moore's HCl/NH_4 to etch a silica layer of a semiconductor device having a silica layer and a titanate layer.

Roh discloses that PLZT, $(Ba,Sr)TiO_3$ and $SrTiO_3$ films are high dielectric films (col. 5, lines 4-7 and 61-63).

The examiner argues that it would have been obvious to one of ordinary skill in the art to substitute Roh's $(Ba,Sr)TiO_3$ or $SrTiO_3$ for Asselanis' PLZT because Roh teaches that PLZT, $(Ba,Sr)TiO_3$ and $SrTiO_3$ are equivalent titanium oxide materials (answer, page 4). The appellants argue that Roh's teaching is that these materials are electrically equivalent, not chemically equivalent, and that Roh does not indicate that $(Ba,Sr)TiO_3$ or $SrTiO_3$ would react chemically to an etchant of $HCl/NH_4F/H_2O$ similarly to a PLZT material (brief, page 5). The examiner responds that the appellants have failed to show that these materials are not chemically equivalent (answer, page 6).[3]

The examiner's argument is not well taken because the initial burden with respect to *prima facie* obviousness lies with the examiner rather than with the appellants. *See In re Piasecki,* 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147

[3] The examiner points out (answer, page 5) that Roh teaches that PLZT, $(Ba,Sr)TiO_3$ and $SrTiO_3$ tend to have an active chemical reaction with silicon or polysilicon (col. 1, lines 47-50). The relevance of this argument is not apparent because the issue is whether it would have been obvious to one of ordinary skill in the art to react HCl/NH_4F, not silicon or polysilicon, with $(Ba,Sr)TiO_3$ or $SrTiO_3$.

(CCPA 1976). To establish a *prima facie* case of obviousness, the examiner must explain how the applied prior art would have provided one of ordinary skill in the art with both a suggestion to carry out the appellants' claimed invention and a reasonable expectation of success in doing so. *See In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). "Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure." *Id.* The examiner has not established that the applied prior art itself would have provided one of ordinary skill in the art with a reasonable expectation of success in 1) replacing Asselanis' PLZT with Roh's $(Ba,Sr)TiO_3$ or $SrTiO_3$, and etching the $(Ba,Sr)TiO_3$ or $SrTiO_3$ with Asselanis' HCl/NH_4F, or 2) using Moore's HCl/NH_4F to etch the silica layer of a semiconductor device having silica and titanate layers. Consequently, the examiner has not carried the burden of establishing a *prima facie* case of obviousness of the appellants' claimed invention.

DECISION

The rejection of claims 8 and 11 under 35 U.S.C. § 103 over Asselanis in view of Moore and Roh is reversed.

REVERSED

Charles F. Warren Administrative Patent Judge	)
Terry J. Owens Administrative Patent Judge	) BOARD OF PATENT) APPEALS AND
Jeffrey T. Smith Administrative Patent Judge	) INTERFERENCES)

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Ratner & Prestia
Suite 301
One Westlakes Berwyn
P.O. Box 980
Valley Forge, PA
19482-0980